Table 2. Combined estimates from random-effects meta-analyses for residential air pollution and respiratory infections during early life (up to 36 months).[a]

	Crude[b]			Adjusted[c]		
	OR (95% CI)	I^2	*p*-Value	OR (95% CI)	I^2	*p*-Value
Pneumonia						
NO_2	1.25 (1.04, 1.50)*	37.1	0.112	1.30 (1.02, 1.65)*	52.9	0.024
NO_x	1.23 (1.06, 1.41)*	22.2	0.239	1.26 (1.04, 1.52)*	44.0	0.066
$PM_{2.5}$	2.13 (0.82, 5.49)	79.7	0.000	2.58 (0.91, 7.27)	81.7	0.000
$PM_{2.5}$ absorbance	1.78 (1.30, 2.43)*	0	0.734	1.99 (1.44, 2.75)*	0	0.663
PM_{10}	1.55 (1.03, 2.34)*	29.2	0.205	1.76 (1.00, 3.09)*	51.2	0.051
Coarse PM	1.23 (1.02, 1.47)*	0	0.626	1.24 (1.03, 1.50)*	0	0.579
Traffic, nearest street	1.08 (1.03, 1.14)*	0	0.997	1.09 (1.03, 1.15)*	0	0.969
Traffic, major streets	1.19 (1.08, 1.31)*	0	0.979	1.21 (1.09, 1.34)*	0	0.843
Otitis media						
NO_2	1.08* (1.01, 1.15)	4.8	0.395	1.09 (1.02, 1.16)*	0	0.515
NO_x	1.04 (0.98, 1.10)	0.5	0.430	1.05 (0.98, 1.12)	0	0.458
$PM_{2.5}$	1.02 (0.71, 1.45)	55.5	0.047	1.06 (0.75, 1.49)	47.9	0.088
$PM_{2.5}$ absorbance	1.05 (0.80, 1.37)	46.7	0.095	1.08 (0.83, 1.39)	39.9	0.139
PM_{10}	0.98 (0.83, 1.17)	11.6	0.341	0.98 (0.84, 1.14)	0	0.539
Coarse PM	0.96 (0.87, 1.06)	0	0.608	0.97 (0.88, 1.08)	0	0.805
Traffic, nearest street	0.98 (0.94, 1.03)	1.4	0.385	0.98 (0.93, 1.02)	0	0.497
Traffic, major streets	1.00 (0.91, 1.09)	0	0.462	0.99 (0.89, 1.10)	18.2	0.300
Croup						
NO_2	0.92 (0.80, 1.07)	0	0.884	0.96 (0.83, 1.12)	0	0.909
NO_x	0.96 (0.83, 1.10)	0	0.895	0.99 (0.86, 1.14)	0	0.936
$PM_{2.5}$	0.83 (0.58, 1.19)	0	0.760	0.90 (0.63, 1.30)	0	0.703
$PM_{2.5}$ absorbance	0.95 (0.66, 1.37)	5.0	0.368	1.03 (0.72, 1.47)	0	0.554
PM_{10}	0.89 (0.70, 1.13)	0	0.586	0.92 (0.72, 1.18)	0	0.595
Coarse PM	0.95 (0.80, 1.12)	0	0.551	0.97 (0.82, 1.15)	0	0.787
Traffic, nearest street	0.98 (0.93, 1.04)	0	0.926	0.99 (0.93, 1.05)	0	0.853
Traffic, major streets	0.97 (0.86, 1.09)	0	0.734	0.98 (0.87, 1.11)	0	0.901

Associations are presented for the following increments in exposure: 10 μg/m^3 for NO_2, 20 μg/m^3 for NO_x, 5 μg/m^3 for $PM_{2.5}$, 1 unit for $PM_{2.5}$ absorbance, 10 μg/m^3 for PM_{10}, 5 μg/m^3 for coarse PM, 5,000 vehicles/day for traffic intensity on the nearest street; and 4,000 vehicle-km/day for traffic load on major roads within a 100-m buffer; associations with traffic intensity and traffic load were additionally adjusted for background NO_2 concentrations.
[a]Outcomes assessed up to 12 months (INMA Valencia), 14 months (INMA Gipuzkoa, INMA Sabadell), 15 months (GASPII), 18 months (INMA Asturias), 24 months (BAMSE, GINIplus, LISAplus, PIAMA), and 36 months (MAAS). [b]Crude models were adjusted for sex and municipality (BAMSE). [c]Adjusted models included municipality (BAMSE), sex, older siblings, breastfeeding at 6 months, atopy of either parent, any child-care reported during follow-up, maternal smoking during pregnancy, any environmental tobacco smoke in the child's home reported during follow-up, visible mold or dampness in the home, use of gas stove, birth season, parental socioeconomic status (low, medium, high), and intervention (GINIplus, MAAS, PIAMA). *$p < 0.05$.

Table 3. Adjusted combined estimates for air pollution exposure at the birth address and respiratory infection by year of life [OR (95% CI)].

	Pneumonia[a] (n = 12,891)	Otitis media[b] (n = 8,722)	Croup[c] (n = 9,101)
Respiratory infections during the first year[d] of life			
NO_2	1.47* (1.15, 1.89)	1.19* (1.07, 1.33)	1.05 (0.83, 1.32)
NO_x	1.45* (1.21, 1.75)	1.09 (0.98, 1.22)	1.10 (0.90, 1.36)
$PM_{2.5}$	4.06* (1.93, 8.57)	1.21 (0.64, 2.28)	1.15 (0.67, 1.97)
$PM_{2.5}$ absorbance	2.71* (1.68, 4.37)	1.32 (0.99, 1.75)	1.04 (0.59, 1.83)
PM_{10}	1.77* (1.18, 2.67)	1.24 (0.76, 2.02)	1.07 (0.75, 1.53)
Coarse PM	1.46* (1.11, 1.92)	1.16 (0.80, 1.70)	1.02 (0.80, 1.30)
Traffic, nearest street	1.14* (1.07, 1.22)	0.99 (0.94, 1.04)	1.03 (0.94, 1.13)
Traffic, major streets	1.31* (1.15, 1.50)	1.03 (0.93, 1.14)	1.00 (0.81, 1.24)
Respiratory infections during the second year[e] of life			
NO_2	1.40* (1.04, 1.88)	1.07 (0.96, 1.20)	0.92 (0.78, 1.09)
NO_x	1.29* (1.07, 1.55)	1.02 (0.89, 1.17)	0.92 (0.78, 1.08)
$PM_{2.5}$	2.65 (0.63, 11.2)	1.06 (0.64, 1.74)	0.76 (0.51, 1.15)
$PM_{2.5}$ absorbance	1.90 (0.93, 3.87)	1.20 (0.80, 1.79)	0.89 (0.59, 1.35)
PM_{10}	1.42 (0.99, 2.03)	1.00 (0.84, 1.19)	0.83 (0.63, 1.09)
Coarse PM	1.24 (0.98, 1.56)	1.00 (0.89, 1.13)	0.89 (0.73, 1.08)
Traffic, nearest street	1.05 (0.98, 1.13)	0.96 (0.90, 1.03)	0.93 (0.81, 1.07)
Traffic, major streets	1.10 (0.90, 1.34)	0.96 (0.83, 1.10)	1.00 (0.88, 1.14)

Associations are presented for the following increments in exposure: 10 μg/m^3 for NO_2, 20 μg/m^3 for NO_x, 5 μg/m^3 for $PM_{2.5}$, 1 unit for $PM_{2.5}$ absorbance, 10 μg/m^3 for PM_{10}, 5 μg/m^3 for coarse PM, 5,000 vehicles/day for traffic intensity on the nearest street; and 4,000 vehicle-km/day for traffic load on major roads within a 100-m buffer; associations with traffic intensity and traffic load were additionally adjusted for background NO_2 concentrations.
[a]Based on four studies: BAMSE, GINI/LISA North, GINI/LISA South, PIAMA. [b]Based on 3 studies: BAMSE, LISAplus North, LISAplus South, PIAMA. [c]Based on three studies: BAMSE, GINI/LISA North, GINI/LISA South. [d]Defined as 0–12 months. [e]Defined as 13–24 months. Models were adjusted for municipality (BAMSE), sex, older siblings, breastfeeding at 6 months, atopy of either parent, any child-care reported during follow-up, maternal smoking during pregnancy, any environmental tobacco smoke in the child's home reported during follow-up, visible mold or dampness in the home, use of gas stove, birth season, parental socioeconomic status (low, medium, high), and intervention (GINIplus, PIAMA). *$p < 0.05$.

diagnosis is complicated by the fact that not all infections present with acute symptoms severe enough to warrant a physician visit, in contrast with pneumonia, which routinely presents with a high fever and/or difficulty breathing (Edmond et al. 2012).

Conclusion

Our meta-analysis of 10 European birth cohorts found consistent evidence for an association between traffic-related air pollution and pneumonia, and some evidence to suggest an association with otitis media. Policies aimed at reducing air pollution may be successful in reducing the overall burden of pneumonia in early childhood.

Correction

The value for "Traffic load on major streets within 100-m buffer" for GINI/LISA South in Table 1 was incorrect in the manuscript originally published online. It has been corrected here.

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